

REMARKS

Reconsideration of the rejection of the subject matter of this application is requested.

Status of Claims

Claims 28, 35 and 36 have been amended to remove an unduly limiting limitation. As is well known, the resistor can be somewhat buried in the silicon substrate. The claims have also been amended to specify that the second resistor contact is electrically insulated from the field plate. If this were not the case the two resistor contacts would short through the field plate. However, the main substance of the invention has not changed. For reasons that can't be explained, most of the claims were presented with paragraphs designated a, b, c, etc. but claim 28 was not. Therefore claim 28 has been amended to make it appear consistent with the other claims pending.

Claims 28-30 and 32-39 are submitted for consideration.

The Drawing

The drawing appears to be acceptable.

Background

The claims in this application have changed slightly during the prosecution to date. The basic features of the invention have remained constant throughout. The claims have been rejected over the Kondo patent alone, in the first action; over Japanese patent 723 in view of Tamagawa, also in the first action; over

Kinashita in the second action; over Kondo in view of Masahiro, also in the second action, and now, in the third action, over Kondo in view of Davis. The Kondo patent is the recurring theme.

Rejections On Prior Art

Claims 28-30 and 32-39 stand rejected under 35 U.S.C. 103 as unpatentable over Kondo in view of Davis.

Kondo patent

As mentioned before the feature in applicant's claims that one of the resistor body contacts lies beneath the field plate, thus saving space on the semiconductor IC, has been argued in detail. Evidently the Examiner appreciates that the Kondo patent lacks this feature, and cites the Davis patent as showing such a contact arrangement. But the combination of the Kondo patent and the Davis patent appears to applicant to be at least as weak than the combinations relied on previously. There is no field plate described in the Davis patent. The polysilicon (or metal) layer 18 in the Davis patent is part of the resistor. This is the same situation previously encountered with the secondary reference in the last action, i.e. the Masahiro patent. How or why one would combine the teachings of these two references is not evident, nor is it described in the Office action. If the layer 18 of the Davis structure is added to the structure of the Kondo patent, an additional layer 18 would be included between the substrate resistor 35 of Kondo, and the polysilicon field plate 41. It would be an added layer since layer 18 of Davis is not a field plate, but is added to reduce

the effects of surface states on the surface of the silicon resistor 12. That is a function entirely distinct from the function of the polysilicon field plate in the Kondo patent. Thus combining these references would logically result in both elements in the resistor structure. The result is a structure completely different from that claimed. Moreover, the runners that overlie the polysilicon field plate (44-5 in Kondo, 90 in applicant's structure) are completely incompatible with the Davis structure. If these reference are combined as presumably suggested by the office action, the runners would reside on the shield layer of Davis and would short to the substrate.

To clarify these points the following claim (taking claim 28 as typical) with reference numbers may be helpful.

28. An integrated circuit having a field-plated resistor the field-plated resistor comprising:
 - a. a resistor body (38, Fig. 6) formed in a semiconductor substrate (20, Fig. 16), the resistor body having first (46, Fig. 16) and second (58, Fig. 16) contact regions,
 - b. a first insulating layer (40, Fig. 4) on the resistor body, the first insulating layer approximately coextensive with the resistor body and having a top surface and a bottom surface
 - c. a contact window (44, Fig. 4) in the first insulating layer and extending from the top surface of the first insulating layer through the first insulating layer to the resistor body,

- d. a field plate (48', Fig. 7) on the first insulating layer and approximately coextensive therewith and with the resistor body, the field plate having a top surface and a bottom surface, with a portion of the bottom surface extending through the contact window in the first insulating layer and into contact with the first contact region of the resistor,
- e. a second insulating layer (66, Fig. 11), with a first portion of the second insulating layer at least substantially covering the field plate,
- f. an electrical contact (82, Fig. 16) to the top surface of the field plate,
- g. an electrical contact (84, Fig. 16) to the second contact region of the resistor, and
- h. a plurality of metal conductors (90, Fig. 16) formed on the first portion of the second insulating layer.

Note that, as argued consistently in this prosecution, there is no resistor contact beneath the field plate in the Kondo patent. An examination of the Kondo patent reveals that the insulating layer that separates the field plate and the resistor body has no window beneath the field plate. The field plate in Figs. 8 and 9 is element 39-1. There is no window in the insulating layer beneath element 39-1, and there is no portion of element 39-1 that extends through a window to the resistor body 35. Since there are no contacts underneath the field plate, all

contacts to the substrate resistor body must lie outside the area of the polysilicon field plate, thus – in comparison with the arrangement of the invention – consuming unnecessary chip area.

Combining the Davis patent with the Kondo patent would result in an added layer as mentioned above. If it is argued that the layer 18 of Davis *replaces* the field plate of Kondo (recognizing first that there is no logic to that) that would result in a layer that is in direct contact with the silicon substrate. Placing conductive runners (90 in applicant's structure) on that layer results in direct shorting of the runners to the substrate. Moreover, since the Davis patent has no insulating layer between "plate" 18 and the substrate, there is no insulating layer corresponding to applicant's "first insulating layer" (40). The Davis structure is very different from that claimed. There is nothing in the Davis figures that corresponds to limitations b., c., and d. in claim 28. The Examiner points to 18/18' and Figure 12 of Davis. But there is no insulating layer in Fig. 12 of Davis between "plate" 18 and the resistor 12. There is no contact window in that region. There are contact windows for contact plugs 26 that extend through insulating layer 22, or 32. But these windows do not extend through a "first insulating layer" as applicant claims, the "first insulating layer on the resistor body". Finally, there is nothing in the Davis structure that corresponds to the limitation, in all of the independent claims, requiring the second resistor contact to be electrically insulated from the field plate. In the Davis structure, if layer 18 is to serve as a field plate, as in the Kondo patent, then the two resistor contacts 26 would short the resistor through layer 18. If layer 18 is made highly resistive, as Davis

suggests, then it will no longer be suitable as a field plate.

The dependent claims, claims 29, 30, 32-34, and 37-39, rely largely on the features of the claims on which they depend for patentability.

In view of the amendments and these remarks, reconsideration and allowance of claims 28-30, and 32-39 is requested.

In the event that the Examiner concludes that a telephone call would advance the prosecution of this application, the Examiner is invited and encouraged to call the undersigned attorney at Area Code 757-258-9018.

Respectfully,



Peter V.D. Wilde
Reg. No. 19658

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Law Firm of Peter V.D. Wilde
301 East Landing
Williamsburg, VA 23185